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METHOD AND ARRANGEMENT FOR THE CONTINUOUS PRODUCTION OF LIGNOCELLULOSE-CONTAINING BOARDS

The present invention relates to a method of producing continuously lignocellulosic boards in accordance with the preamble of claim 1, and to an arrangement for carrying out the method.

Methods of producing boards from lignocellulose-based raw materials are well known to the art and have found wide use in practice. The manufacture of such boards includes the following main method steps: disintegration of the raw material to fibres and/or particles of appropriate size, drying the particles and/or fibres to a determined moisture ratio and gluing the material either prior to or subsequent to said drying process, shaping the glued material to form a mat, which may comprise several layers, and optionally cold pre-pressing the mat, pre-heating said mat, water-spraying mat surfaces etc., and heat pressing the mat in a discontinuous press or in a continuous press while subjecting the material simultaneously to pressure and heat so as to obtain a finished board.

A well-known problem with present day manufacturing technology, irrespective of whether it involves discontinuous presses or continuous presses, is that gases are generated in the press during the compression process, which takes place at high temperatures. These gases consist of water vapour (steam), different volatile substances dissolved from wood and glue, so-called Volatile Organic Compounds (VOC), and gaseous phenol from wood and glue, etc. It has been found that long-time exposure to these substances results in irritation, and that they are also harmful to personal health when present in sufficiently high concentrations. Consequently, the authorities in the majority of countries in which boards are manufactured in accordance with the aforesaid methods have elaborated a set of rules and regulations that state the emission concentrations that are permitted in work places and the permitted concentrations permitted in emissions to atmosphere.

Since present day press technology involves the use of homogenous heating plates or steel bands, only a minor part of the gases generated in press will leave the boards through their edges in the compression process. However,

the major part of these gases will leave the board as it exits from the press. The influence of these gases on the working environment can be limited to some extent with the aid of protective casings and covers, although air at room temperature is normally used as transport air because of the large size of the presses. Consequently, this air volume will normally exceed the requirement of combustion air in the standard heating plant of the factory. This has necessitated the installation of complicated and expensive equipment in connection with the majority of plants in which lignocellulosic sheets and boards are produced. For instance, the plants will normally include so-called RTO (Regenerated Thermal Oxidizer) units or scrubber systems for purifying press gases.

The object of the present invention is to provide a method and an arrangement for producing lignocellulosic boards without VOC-emissions or formaldehyde-emissions to the workshop areas concerned and to the ambient environment, and also obviating the need to install expensive purification equipment. This object is achieved with a method and an arrangement according to the invention that have the characteristic features set forth in respective claims.

The invention will now be described in more detail with reference to the accompanying drawing, which is a schematic longitudinal section view of an arrangement in accordance with the invention.

The plant illustrated in the drawing is based on the plants disclosed in SE 502 272 and SE 504 638, which describe two continuous steam-press processes. A fibrous mat 1 previously formed in the manufacturing process is compressed in a continuous steam-injection press 2 to form a board or sheet 3, which is then passed through an after-conditioning unit 4. As the fibre mat 1 passes into the nip between two steam-injection rolls 5, steam is delivered and injected into the mat through wires 6. The temperature rises very quickly to above 100°C; a typical temperature is above 120°C. The mat is herewith formed into a solid board 3. The pressure falls as the board leaves the nip between the steam-injection rolls 5, and the temperature therewith drops very quickly to about 100°C. This takes place by virtue of the extremely rapid vaporisation of part of the enclosed moisture. VOC-emissions and formaldehyde-emissions accompany the departing steam.

Because this process takes place between two gas-permeable wires 6, the steam and the gases departing with the steam are able to leave the board across the whole of its width. Steam and other emissions are captured before being able to escape into the workshop area or to ambient atmosphere, by a suction unit 8 provided to this end inside the press. Air heated to a temperature in excess of 100°C is transported to this suction unit. The hot air is used together with leakage air from the surroundings as a vehicle gas for the steam and said other emissions. The hot air, leakage air, steam and emissions are transported to a heating plant 9 in the factory, for combustion. A hot air delivery unit 11 is connected to a curing zone 10 in the press 2, and the hot air supplied is then passed to the suction unit 8.

The temperature is maintained at a high level partly to prevent the emissions and the steam from condensing out to the suction system and partly to utilize the fact that the moisture carrying capacity of the air, calculated per kilogram of air, increases with increasing temperatures. This enables the total air volumes and gas volumes to be maintained at levels which do not exceed the volumes of combustion air that are required by the standard plant system to generate the heat and process steam necessary for the production of such board material. Consequently, no other equipment need be installed to prevent emissions to the surroundings.

Subsequent to the board having been produced in the continuous steam injection press 2, the board is passed into the after-conditioning unit 4 (see SE 504 638) where a pre-determined volume of air heated to a pre-determined temperature and having a pre-determined moisture content is sucked through the board so as to obtain a desired board moisture content and temperature. The air leaving the after-conditioning unit will also contain emissions of VOC and formaldehyde, although in smaller quantities; measurements taken in a pilot plant have shown that the major part of the emissions occur in the continuous steam-injection press. For this purpose, a suction unit 12 is arranged in the after-conditioning unit 4. Air is sucked in at 13 and heated by a heater 14 and is supplied with steam through the conduit 15.

The air leaving the after-conditioning unit is transported to the hot air supply unit 11 of the steam-injection press 2 and its curing zone 10, by means of a suction fan 16. As it passes to the supply unit 11, the air is given additional energy through the medium of a heat exchanger 17. If the air from the after-conditioning unit 4 is in excess, the excess can be mixed with the flow from the press 2 in a closed hood 18 and passed to the heating plant 9. If there is a deficiency of air to the curing zone 10, the suction fan 16 draws-in extra air through the closed hood 18. The air leaving the after-conditioning unit 4 is thus used as hot input air for the internal suction unit 8 of the continuous steam-injection press. Measurements have shown that these volumes are sufficient to fulfil the requisite transport volumes needed for the continuous steam-injection press.

Subsequent to having passed through the after-conditioning unit 4, the board 3 may optionally also be passed through a surface-densifying press in accordance with SE 502 272 (not shown in the drawing). This latter press also includes a special suction unit that functions to capture in said press those emissions that are transported to the combustion plant of the factory with the aid of hot air, for the production of heat and steam.